had presented its broadside to the launch. As the boat approached bow on, it corresponded to a target somewhere about six feet square, presenting a convex surface to the impinging sound-wave. Even in this case a feeble echo was perceived when the boat was at a considerable distance (estimated to be nearly one-quarter of a mile). That any echo should have been perceived at all under such circumstances, was a surprise. The sound was heard only by the closest attention, but in the case of larger vessels the effects were very distinct and striking.

Experiments were made which demonstrated the fact that the speaking-trumpet attached to the gun was of material assistance in giving direction to the sound-impulse, and in intensifying the audible effect.

Mr. Della Torre claims that a steam-whistle or siren, combined with a projecting apparatus like a speaking-trumpet, will prove as efficient as the gun.

During the experiments on the Patapsco River, a curious rumbling effect, like the rolling of thunder, was often observed, which continued for some seconds. A similar sound was also noticed, as an echo from a well-wooded shore; but the effect alluded to above could not have been due in any way to the land, as the sound commenced immediately upon the firing of the gun, whereas the shore was distant at least a mile or a mile and a half.

The sound was probably due to the presence of ripples on the surface of the water, as the effect was much less marked when the surface was smooth. Such a sound might prove a disturbing element of importance in a rough sea, but would hardly be sufficient to prevent the detection of an echo from a large iceberg. Had shots been fired periodically from the bow of the City of Berlin, it can hardly be doubted that the presence of an obstacle ahead would have been discovered in time to prevent the collision that actually occurred.

ALEXANDER GRAHAM BELL.

SOME PECULIARITIES IN THE AGE STATISTICS OF THE UNITED STATES.

SHORTLY after the issue of the present census reports, attention was called to the peculiar fact that very many more persons were recorded as being just 20 or just 50 years old than were as being 19 or 49. It is easy to see that there ought to be more persons living at any one year of life than at the next, — more at 7 than at 8 years of age, more at 19 or 49 than at 20 or 50. Of all the infants less than a month old at the present moment, quite a large number will die before completing their first year; many of those then surviving will die before the end of their second year; and so on, there being fewer left in each year than in the preceding year.

But all this is true only when certain conditions are satisfied. The growth of the population, it is assumed, is by natural increase alone, or nearly so. The number of foreign-born inhabitants, for instance, between the ages 10 and 15, will be smaller (that of native Americans, of course, very much larger) than the number between the ages 20 and 25, because so very many of the immigrants are, on arrival, between 20 and 25 years old. So, too, a war, or an epidemic which is particularly fatal to persons between certain ages, might be the cause of an exception to the general rule, at least until the generation so affected had died out.

But the effect of any such circumstances on the census figures which are here dealt with, may, without hesitation, be regarded as insignificant. The preponderance of the number of persons at the ages containing round numbers, over the number at the age immediately preceding (this being rather an 'odd' number), must be ascribed to an entirely different kind of influence.

Before going farther, it is necessary to appreciate how enormous the attraction towards round numbers really is. Very naturally this attraction is greatest towards the ages containing multiples of 10, for then the numbers are 'roundest.' Subtract the number of persons recorded as 9 years old from the number recorded as 10, and express this excess in percentage of the number at 9 years. Do this for the excess of the number at 20 over the number at 19, of 30 over that at 29; and so on, the last being the excess of the number at 90 over the number at 89 years of age. The average of the 9 percentages thus obtained is what I will call the average '10 exaggeration,' any one of the percentages of which it is composed being spoken of as the '10 exaggeration' at 20 or 30 or 60 years, as the case may be. This average for the total population of the United States is $71\frac{1}{4}$ %; and the several percentages of which it is the average vary from 9.5 % to 126 %. This means, that instead of finding fewer persons recorded at any such 'round' age as 20, 30, etc., than at the age immediately preceding (19, 29), you would find, on the whole, nearly $1\frac{3}{4}$ times as many. You might find only $1\frac{1}{10}$ (an excess of 9.5 %)

as many if you happened to select 10, or even $2\frac{1}{4}$ times as many (an excess of 126 %) if you selected 60, as the age.

The comparison of this average '10 exaggeration' for the total population, with that for the native whites, the foreign-born, and the colored inhabitants, — making, in each case, the distinction between male and female, — will serve as a good starting-point. Fig. 1 expresses the result graphically. The first of each group of three lines shows the '10 exaggeration' of the total number of the class which it represents; the second line that of the male, and the third that of the female, portion of it. The first set of three lines represents these averages for the total population; the second, for the native whites; the third, for the foreign-born; the fourth, for the colored population.

The enormous exaggeration of the colored [1] people is the first striking, appalling fact. Their average '10 exaggeration' is 432 %: in other words, there are $5\frac{1}{3}$ times as many colored persons recorded at any age containing a multiple of 10 as at the preceding age. The native whites, as one would expect, are the most reliable class, their average excess being 28 %. The average of the foreign-born (103 %), while not in all strictness comparable with the others, may yet be considered so for our purposes. It is evident that the negro is the being upon whom all the various causes tending to produce this peculiar falsity of returns are the most active. The foreign-born are also very susceptible to these tendencies; and doubtless misunderstandings between the foreigner and the census official, owing to a meagre acquaintance with the language, enter as an additional disturbing influence. Moreover, in both these classes the general illiteracy is decidedly above the average.[2]

The next consideration is that of sex. The gentler sex in each case exaggerates more than the male sex, and, in the case of the colored people, considerably more. For the total population, the male average is 61 %, the female 81 %; for the native whites, male 22.5 %, female 33.5 %; for the foreign-born, male 92.6 %, female 113.8 %; for the colored, male 352 %, female 536.5 %. The average excess of the native white males (22.5 %), and that of the colored females (536.5 %), serve as a significant contrast. Next to the exaggeration at the ages containing multiples of 10, naturally comes that at the ages containing multiples of 5. This '5 exaggeration' follows the

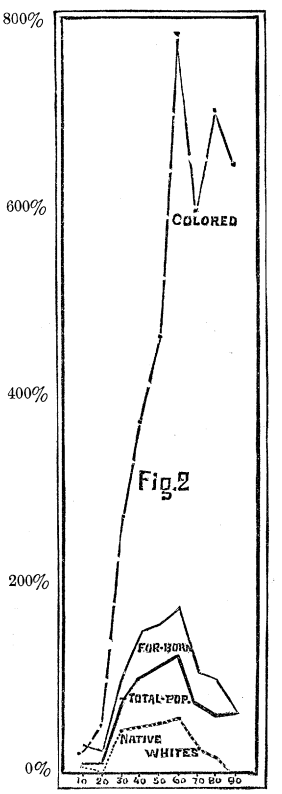

Fig. 2

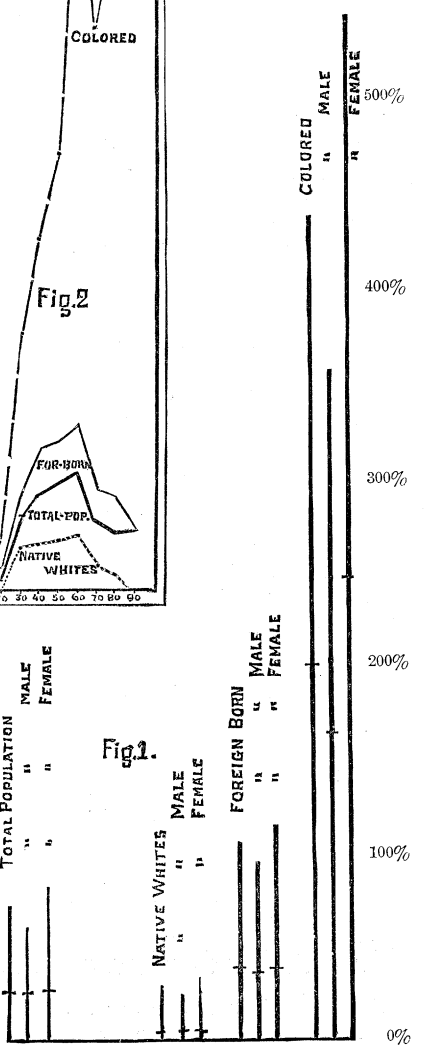

Fig. 1.

same course with reference to race and sex as the '10 exaggeration,' and is represented in fig. 1. by the part of each line cut off between the cross-mark and the foot of the line. For the total population it is 26 %, as compared

[1] It should be mentioned that under this head are included the Chinese, Japanese, and civilized Indians; but the exclusion of these would not appreciably alter the results.

[2] I have traced out in detail the close relation between this '10 exaggeration' and illiteracy, which, however, would be too long to give here. A set of lines representing the illiteracy for the several races and sexes would closely resemble fig. 1.

with 71 % for the '10 exaggeration;' for the native whites it is 3 %, as compared with 28 %; for the foreign-born 36 %, as compared with 103%; for the colored 200 %, as compared with 432 %.

If we subdivide the native male whites, the most reliable class, into the native male whites of each state and territory, we find great differences between the averages of the several states. The inhabitants of New Mexico, though native male whites, are in the habit of mendacity, at least Mexicans, and their '10 exaggeration' is 292 %. So, too, the native male whites of the southern states, where too close intimacy with the 'round-number loving' negro seems to be dangerous to statistical accuracy, have a high average; while all the New-England states are in the best third of the list, and all but Rhode Island in the best dozen. Other good states are Iowa, Ohio, Pennsylvania, Indiana, Minnesota, Wisconsin, and Michigan.

Having ascertained to what extent each race and sex exaggerates with reference to 'round-number' ages, it remains to trace the extent of this exaggeration at each of the 'round' ages. In this the graphic method will be an aid. The heavy line in fig. 2 represents the variations in the size of the '10 exaggeration' at the ages 10, 20, etc., up to 90 for the total population: the dotted line does the same for the native whites, the light line for the foreign-born, and the broken line for the colored. The distance from the point where the curve begins to the base-line measures the '10 exaggeration' for the number at 10 years; the distance from the point of junction with the second ordinate to the base-line measures the exaggeration for the age of 20; and so on, as indicated at the foot of the diagram. With the exception of that for the colored people, the curves are very similar. In each case, the ordinates are about as high at the point 20 as at the point 10; i.e., persons in the neighborhood of 10 years of age are about as apt to call themselves 10, as those in the neighborhood of 20 to call themselves 20, years old. After this point, however, the excess gradually increases for each decade, until the maximum is reached at 60. From 60 on, there is a more or less uniform fall to the last point at 90. But in the colored race the work of exaggeration is developed on a much vaster scale. Each decade has a higher excess than its predecessor, until, in this series of steep ascents, the apex is reached, as before, at the age of 60, when the excess is 930%; that is, over 10 times as many colored people lay claim to the age of 60 as to that of 59. After the point 60, the exaggeration falls, but rises again at 80, ending with a slight fall at 90.

With regard to sex, as before, at each age (except at 10)[1] the females exaggerate more than the males: these differences are greatest at 70, 80, and 90 years.

It is natural that the giving of one's age in round numbers should be a more common practice with old than with young people. There is a greater difference between being 19 and being 20 years old than there is between being 59 and being 60. Younger persons, too, are more apt to know their exact age than older ones. The second half of each curve, then, is higher than the first half: this is especially evident in the curve for the colored people. But why this excess should be greatest at 60, is not apparent: 50 would probably have the strongest claim to be considered the '*roundest*' age. Or is 59 an '*odder*' number than 49? It seems that the condition of mind to which a round number is most apt to present special charms is most likely to occur near the end of the fifth decade of life. The age of 80, however, in the case of the colored people, plays almost as prominent a part as 60. The fact, too, that in the seventh, eighth, and ninth decades of life the greatest differences between the exaggerations of the two sexes occur, is interesting. It seems to indicate that old women, and notably old colored women, are far more forgetful of their ages than old men. For the colored males, the exaggeration at 80 is 520%; for the females, 920%.

If we were to trace similar curves for the '5 exaggeration,' we should find, 1°, that they would all be much lower (i.e., the exaggeration is less, as is also shown in fig. 1); 2°, that the curves would hold the same relative positions, — the native white lowest, then the total population, then the foreign-born, and much higher the colored; 3°, that the highest excess occurs at 45, except in the colored curve, where it is at 75; 4°, that the curves are less regular; 5°, that the exaggeration of the females is greater than that of the males, and differs most from it at the higher ages. It is peculiar that the greatest '5 exaggeration' occurs at 45, while the greatest '10 exaggeration' occurs at 60. The exaggeration at 65, however, is not much smaller than that at 45, and in the colored is actually larger, though here both are smaller than the excess at 75. This is what the 'roundness' of the number '75' would lead one to expect.

While in the '10 exaggeration' the second

[1] And here the difference between the sexes is very small.

half of the curve is higher than the first, in the '5 exaggeration' the two halves (except in the case of the colored people) are about equal. The '10 exaggeration' is thus rather a characteristic of old age, while the '5 exaggeration' is used by old and young.

There remains another peculiar irregularity of the census figures which deserves special treatment. It is the excess of the number of persons at 21 over those at 20 years. This excess is not of the same nature as the '10' or '5' exaggeration, and is due, of course, to political reasons; 21 being the voting-age, and 1880 the year of a hot presidential campaign: accordingly this exaggeration ought to occur in males alone. This is really the case. In estimating the size of this excess, we encounter a difficulty. To compare the number at 21 with the number at 20, would probably be comparing one exaggerated number with another; and, knowing that the number at 19 is too small, we cannot make a fair comparison with it. It is sufficient to notice, however, that there are always more males (and fewer females) at 21 than at 19, and, when the '10 exaggeration' at 20 is not large, more than at 20. Taking into consideration the excess at 20, we have to declare the native male whites (the most reliable class in the former exaggerations) as the class that exaggerates most at 21, — a conclusion quite natural, because they are most apt to be benefited by such falsity of returns. With regard to states, the inhabitants of the extreme west (Dakota, Wyoming, etc.) would rank as the worst, the New-England states as the best, under this head.

Whether this exaggeration is increasing or decreasing, is a question which unfortunately can be only very partially answered. Previous to 1880, the returns on age were given mainly in groups of five years. In 1870, however, all persons above 80 years of age were enumerated by single years. This makes possible a comparison between the excess of the number at 90 over that at 89 in 1870 and in 1880. This comparison is entirely in favor of the census of 1880. In this decade the exaggeration at this particular age (90 over 89) has fallen, for the total population, from 104.6% to 65.7%. As to sex, the male excess has fallen, from 87.1% to 36.7%; the female, from 118.7% to 90.3%. The colored people, too, have decreased their excess very greatly, — from 1267% to 647%. Two other peculiarities in the returns of 1870 may be noted: first, the difference between exaggerations of the sexes is less, disappearing entirely in the colored race; second, the excess in the native whites is exceptionally high, being 155.3%, while in 1880 there is no excess at all, but a deficiency of 4.8%.

The observation of such facts as have been here noticed, it is hoped, will shed light on the characteristics of the natural bias in favor of round numbers, as well as be a means of suggesting modifications in the method of questioning which would obviate these misrepresentations. It is just such irregularities that detract from the value of the census figures with regard to the calculation of the life-period, and expectation of life, in the United States. A more thorough comprehension of the questions treated above will doubtless be attainable from the census reports of 1890.

JOSEPH JASTROW.

CHOLERA INOCULATION.

A LETTER from Dr. J. Ferran of Tortosa (Catalonia) to the French academy (*Comptes rendus*, No. 15, 1885) contains some interesting assertions in regard to cholera and the cholera bacillus. He finds that cultures in *bouillon* at 37° C., carried on long enough to just visibly change the fluid, will, in doses of from two to four cubic centimetres, kill a guinea-pig.

At the point of inoculation appears a hot and painful tumor, which dries up and becomes detached, leaving an ulcer behind, which heals without pus formation or pain. The general symptoms are a rapid rise of temperature, bringing on a lowering of the physiological heat as taken in the rectum.

If a drop of blood be taken from an animal thus inoculated, and during life, and this drop be inoculated in *bouillon*, kept at 37° C., in from twenty-four to forty-eight hours a pure culture of spirilla will be obtained.

Microscopic examination of the serous effusion, coming after a blow upon the inoculated side, shows the following: —

1°. Extraordinary number of globules, so much so as to make one doubt the nature of what is being observed. Many of the red-blood globules have projections, and possess a real movement due to the striking of the microbes against these points. 2°. Spirilla and commas, almost invisible by reason of their rapid movements. 3°. Spherical cells full of granulations, some of them containing a granulation resembling a degenerated blood-cell. 4°. Lenticular elements, varying from five to twenty millimetres in size, and differing from the others described above.

A series of cultures in gelatine preserves its virulence, whilst a series in *bouillon* becomes attenuated after a certain time. If a series of guinea-pigs be inoculated with a quantity of the culture less than sufficient to kill them, they become capable of resisting doses which would before have been fatal, — a result which the writer claims he has obtained.

Effects of the microbe upon man. — The injection